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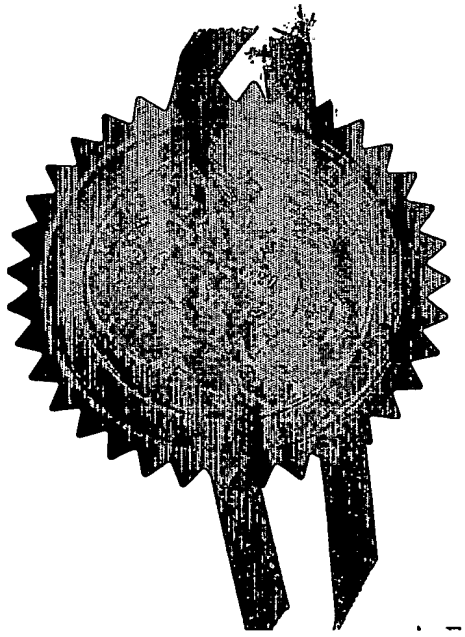

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P01/7700 0.00-0306793.1

Request for grant of a patent

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24 MAR 2003

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1. Your reference

2. Patent application number
(The Patent Office will fill in this part) 0306793.1

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
Timothy Richard Parry Daves
80 RICHMOND WAY WIGAN

Patents ADP number *(if you know it)*
8362444001

If the applicant is a corporate body, give the country/state of its incorporation —

4. Title of the invention
DE-MOUNTABLE STRUCTURAL/FRAMING ~~SYSTEM~~ SYSTEM

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Patents ADP number *(if you know it)*

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number (if you know it)	Date of filing (day / month / year)
UK	0208488.7	12.4.02
	0217062.2	24.7.02
	0217164.3	24.7.02

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing (day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

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Description	12 ✓ DL
Claim(s)	0
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Drawing(s)	~~Key to Drawings~~ 1 16+16 ~~Contents of Drawings~~ 1

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Priority documents	0
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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
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Any other documents *(please specify)*	key to Drawings, contents of Drawings

11. I/We request the grant of a patent on the basis of this application.

Signature T Harry Davis Date 23.3.03

12. Name and daytime telephone number of person to contact in the United Kingdom self 0207 602 7560

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DE-MOUNTABLE SRUCTURAL/FRAMING SYSTEM

- **OUTLINE DESCRIPTION**

This invention relates to a demountable structural system for attaching a planar element(s) which is generally rectangular , and generally rigid (but also stiff or resilient) to a support structure to which other functional components can be attached demountably (or otherwise). Some such functions uses are listed , non-comprehensively below but, with a transparent planar element, the invention is, in several embodiments, particularly suitable for use as a demountable framing system for display purposes which generally involves the secure placement of displayed material behind a (display) screen and providing a means of "hanging" the ensemble on a vertical surface or presenting on a horizontal surface, as well as other display options, (and other functional options,) associated with multiples.

- **BACKGROUND** with reference to other display structures.

Most frames are made of flange elements assembled with fixings to enclose the screen and displayed material. Known "clip frames" replace the flanges with clips .A recent patent, US Patent No 6282828 makes the entire frame into a bowed clip mechanism, mainly for table top use.This involves the planar element (display screen) being an integral structural element: as do the main versions of the current invention, but is not vital in holding the screen within a frame.

Other designs include flexible hooped frame elements , inflexible hoops with slots for the corners of flexible display items, curved panels with elastic or rubberised ties, and a seemingly traditional frame, (as seen at the Tate Modern), with a spring loaded corner junction, instead of a potentially, one piece cut-out frame unit, (or no frame at all) as proposed by the current invention.

As with the above systems the proposed invention is intended to be inexpensive, being suitable for flat packing ,self-assembly, and capable of being made from inexpensive materials. It can be used to display photos prints certificates etc., as well as clocks, mirrors, "windows", screens, lamps, or electronic displays.
Three dimensional multiple versions can be obviously adapted to form lamps, screens, boxes and many other entities.
It is intended that the displayed material be smaller than the display screen leaving a transparent margin exposing the structural mechanism, and so allowing flexibility of size.

- **AIMS OF THE INVENTION**

The invention aims to provide means of hanging (and table top use) of a display item securely located behind a generally, "flat, rectangular and rigid" (or stiff and resilient) display screen. It aims to avoid the standard frame format which involves the frame element(s) overlapping the front of the display screen and even the perceived visual interruption caused by clips on the sides of most clip frames. This problem is minimised in the frame-less version of the invention.

The preferred version also ensures that the surface of the display item is aligned with the front surface of the frame element, since the display screen is positioned in front of the frame element. The basic version holds the display screen so that its surface corresponds to the front of the display screen which is also preferable to the norm.
It is considered important that any visible diagonal structure only meets the display frame edge at the corner, and thus also passes the corners of similarly proportioned display items. The use of a transparent margin exposing rear structure, and the articulating gap, between frame element and display screen, in which the connecting hoops sit, are considered as attractive visual features integral to the design, (though not obligatory as they need not be expressed).
However "decorative"/ other features may be added , such as spandrels sited in the said gap (also being capable of providing extra security), elasticated elements looped around all hoops (also for extra security), and "backing sheets" visible in the transparent margin, any of which may be coloured or otherwise "decorated".

DESCRIPTION OF THE INVENTION AS STRUCTURE

This is intended to connect the essence of the invention to claim 1 as it is currently anticipated .

The structural assembly comprises planar element, made of a generally stiff, resilient or rigid material (and generally transparent to function as a display screen) and normally two (but at least one) primary stressed structural member(s) held between hooped points of contact with, normally, all four(at least two opposing) corners of the planar element(s) (which may comprise more than one similar element), so that their attempt to regain an unstressed form renders them secure.

Though not necessary for structural stability, other elements, such as suckers for instance, can be added for extra functional security, with regard to applied forces, in the case of the hoops being integral to the stressed primary members.
If the hooped (or otherwise holed elements) are separate from the primary members then other elements and/ or mechanisms are *necessarily* attached to render said hooped elements stable.
Foremost of these is the frame element which prevents the hoops from sliding off but this in turn needs to be secured by the extension of the primary members to overlap the frame element and by another pair of structural members on the opposite side of the assembly, also over-lapping the frame element, (and acting as bolts with respect to possible rotation of the hoop elements.)

or by means of the primary members being attached to the frame element directly by various means with different versions arising from the means of (demountable) attachment used.

These include the **preferred version 4a** which involves the rear pressure supplied by "rear" mounted structural members to also maintain hoops in a forward position where they will not simply rotate off the corners of the planar element, (since the frame element provides a fulcrum) while the frame element's connection to the rear support structure also prevents the hoops from sliding off the corners of the planar

element completely. This extra mechanism replaces the front bolting members as featured in other versions (or renders them optional). Other means can be found to maximise the pressure provided by the rear support members such as both passing over a rear backing panel /packing element, and pre-forming them into a curved shape which has to be stressed into a flatter mode to fit into the hoops at both ends.The mechanism can operate with pressure from any source including deformations due to pre-stressing, wedges and so on.

Note:
While elasticated hoops do not provide stable attachments , linear structural members which use their elasticity to secure themselves, can, *if sufficiently taut*, generally perform their necessary blocking and support functions well enough not to be excluded as possible embodiments of the invention, and can be achieved by someone with appropriate knowledge in ways other than as shown in the drawing as an example. In fact ties of any kind can be used, providing tautness can be achieved as for instance with springs (inter-linking strings, straps, stiff rods, or other elements.)
Where the resilience necessary for demountable assembly is provided elsewhere (as in version 1, for instance), the connecting member, between hoops may also be rigid, or stiff. The embodiments as described generally use resilient primary (and secondary members) and are referred to as "rods".

Resilience of the planar element (generally described as the display screen, but can also be the displayed item itself), will result in counter flexing of that element which is structurally acceptable but generally not functionally preferred. The definitive conditions of the invention assume that the planar element can be rigid, as a flexible planar element can be inserted directly into a frame element.
Any resilient element can also be pre-formed into a curve so that their deformation into a straighter form will apply pressure instead of by deforming a "flat" resilient member.(Other elements may need to be adapted to fit these pre-formed elements.)

Multiples can be made in generally obvious ways and ways set out in relation to specific embodiments described below, and as may be applied to other embodiments.

The rear pressure is also used for the location of the display item in the case of a "display frame," and the primary rear members also provide the basis for hanging vertically, and horizontal support.

DESCRIPTION OF INVENTION AS A DISPLAY SCREEN

This submission divides the invention into five versions, each of which is fully de-mountable, thus potentially able to be self-assembled. Easy access, means display items can be easily replaced by sliding, in or out. Linear/planar elements, on the reverse, apply pressure generated by dimensional accuracy or flexing, directly or indirectly to the back of the display screen to hold display items in place. Being secure they are the basis for hanging systems so these latter do not attach to, or penetrate, the frame element of necessity.

A strut for tabletop use can also be attached behind the display screen. The display screen is not holed, but assumes a generally rectangular geometry, (or other shapes made to provide necessary "tongues " in place of rectangular corners, as may be contained by hoops, (or the frame element where present.)
In all cases the assemblage requires no gluing, welding, screws, nails or other permanent fixing. Another common feature is the ability to hang parallel to the wall, (partly as a safety feature as this helps to protect hoops being dislodged by contact with the wall.)
Multiples are generally possible with frame extensions, continuous backing sheets, and/or extension rods to link units together.

Variants Summary:

- Version 1: no frame element . A strap of resilient material is twisted and attached by wrapping hooped ends around the corners of the display screen staying in place when a simply stretched elastic member, or flexed resilient member would slide off.

- Version 2 : frame element with only main window aperture (including space for hoops to be securely accommodated. ie., this option notionally includes slots being provided for hoops as an alternative to the window opening, since the structural implication is the same in principle.)

- Version 3: frame element with window and holes in the plane of the frame element ie., some or all rods being located in these holes.

- Version **4a :** frame element with holes in the inside edge of the frame aperture. Ie. rods located in these holes, and also the hoops which then hold fast by means of a restricted rotation mechanism, such that front rods to acting as security bolts, become an optional extra.

- Version 4b: front and rear rods attach to the inside edge of the frame element by means of slots or clefts in the ends of the rods such that the frame element can be located within them. Since the rods would, in principle, be able to slide in relation to the frame element they are passed through hooped elements attached to the corners of the display screen as usual, and they are prevented from rotating within the location slot, which is simply the same width as the minimum need to accommodate the hoops in their angled position. Unlike version 4a there is no need for the window aperture of the frame element to have an angled corner to support the hoop. The gap between the display screen and the frame element is such that the rods can meet the frame element in such a way that it can be rigid and not needing to deform to meet the rods but the rods will generally need to flex, (unless non-central end slots in large diameter rods and/or a flexible frame element.) Rear rods can still be diagonal or horizontal.

- Version 5: Hoops are integral folded sections of frame element placed as usual.

Variants and development

Version1

The first variant does not use a frame element, achieving the above functions, by means of two twisted straps of resilient material, with integral holes provided, to enable these straps to be pulled onto the corners of the display screen.

A central hole is provided for hanging, and, to adapt to tabletop use, a strut, such as a concertina drinking straw, can be (demountably) attached with an element such as a paper clip. (This is done by passing one end of the paper clip through the central hanging hole, and then the short end of the straw is located in it and the other section of the straw is located in the other end of the paper clip such that the concertina joint is positioned above the central joint. The main part of the straw now extends down and outwards to act as a support.)

The attachment of the integral hoops is vulnerable to removal by applied force and is also subject to the torsional stress in the member compounded by local stress as the member is pulled over the corner of the display screen. The addition of suckers placed under the members , next to the corner, will itself be secured (as suckers alone were found to be unreliable) and control the stress on the member at the corner and be present a means of attachment for other elements such as stiff hoops or frame elements to reduce vulnerability of the connections of the main members at the at the corners. In fact the resilience of suckers (with a "nipple" top) means that stiff hoops may be attached and located on the corners of the display screen as the primary , or only, means of attachment.

Leverage upwards on the "nipple" will tend to dislodge the sucker which needs to be resisted by the means of connecting to elements anchored in their relative position by means of the planar element. Though the sucker 's prime function is to enable a hoop to attach to the display screen at an angle. without suction, would be effective The resilience which is characteristic of the suckers can alternatively be provide by other element(s) in the assembly, since it is required as the means of attachment to "close" the assembly over the display screen (which can itself be the resilient element.)

Multiples can be made, for example, by linking rods penetrating slots or holes in the rear straps to produce a locating torsion to resist gravity.

The next version was developed in order that a frame element would give protection to the corner hoops.

Version 2

The second variant uses a planar frame element: the display screen is held in place by means of rods (or other linear elements such as ties) which pass through "hoops" (in fact in the form of standard washers) which are placed between the display screen and the frame element such that the rod ends bear on the front and rear surfaces of the frame element. The rods may be vertical or horizontal and in the case of the rear rods also diagonal as is generally the case but can also be the same as the front rods to align with decorative corrugations in the frame element. Rear rods

can support/attach to a decorative sheath folded around the main frame element as shown in the drawings. This folded sheath form can also replace the frame element.
The rear rods are placed diagonally in order to be effective, partially owing to their crossover, in applying pressure to the rear for location of the display item, but may also be parallel. The flexure of the rear rods (possibly over or through a backing panel, visible/decorative or otherwise,) serves to keep them in place, whilst a pair of front rods is flexed for insertion into the hoops' maximum "face on" radius to be gripped by the smaller radius presented by the hoop when the rods are in place parallel to the edges of the display screen. Hoops need not be diagonally holding the display screen but may be restrained from lateral or vertical movement by the rods in them being blocked by meeting corrugations or obstacles in the frame element.) However the preferred position for the hoops is at the corners where they also hold the corners of display screen within their openings.

The frame element can prevent movement of the rods simply by an all around gap between the display screen and the frame element being the minimum necessary to accommodate the rims of the hoops so that they cannot rotate, since one rim will be blocked by the frame element.
Other arrangements are possible providing only that the hoops are supported. The preferred version uses an angled internal corner to the frame element. The outer edge is open to variation and the plane of the frame element may be distorted or curved for decorative or functional reasons, such as being free standing. A strut can be provided at the rear and adaptations for hanging as shown in the drawings.

A disadvantage of this basic version is that the assembly is unstable during construction; this is mitigated by using elastic bands pulled around the frame element and other elements. In response to this consideration subsequent versions were developed. The common feature of these versions is that at least one pair of rods, (generally at the rear), is attached to the frame element thus creating a "jig".

Version 3
This involves the frame element providing holes or recesses into which the rods ("linear elements"), with hoops attached, are located , by sliding, (or "flexing" in the case of recesses.) The hoops are then placed over the corners of the display screen, and front rods can be inserted to function as bolts. Depending on whether the rods penetrate the frame element from the rear or front the frame will be subjected to pressure to become concave or convex. These were referred to as" versions 2 and 4" in my earlier filing. (0217062.9 July 24 2002, and are now called 3a, 3c respectively.
Custom hoops can be used to ensure they are still supported by the frame element (in spite of curvature), and so the front rods are not required. Previously "version 3", this is now "version 3b."

FOR VERSION 4 SEE BELOW.

Version 5 uses a hoop /frame composite such that the hoops are made by folding a flap up, down or round to the normal hoop position. As this hoop can resistantly meet the display screen, the front security rods, become optional.

Folded under flaps also act as spacers for parallel hanging.

Version 6 as shown in 0217062 showed front and rear rods penetrating eight holes in the frame element which then blocked movement of the display frame by contact with it (and potential clamping).
Version 6b: A perceived improvement for the rods to attach directly to the inside edge of the display screen either by being accommodated within it (and being unable to slide, as was described in 0217164.3 so that a fluted frame structure could be used.)
Version 6c rods prepared with a groove in the ends can locate onto the inside edge of the frame element by resiliently flexing. Though they may be tight fitting in principle they can slide: this can be prevented by using a corrugated material for the frame element (preventing sliding in the most critical direction , and/or using a corner hoop as in previous versions. A parallel sided gap ,of minimum width to accommodate the hoops on the corners of the display screen, is adequate to ensure the hoops cannot rotate off and this gap allows space for the rods to deviate from the faces of the display screen to meet the inside edge of the frame element, without the frame element needing to deform, as is generally the case when rods are located in holes in the front and rear of the frame element. It follows that the frame element can be rigid in this version. To apply rear pressure for location of the display item, said item must be large enough to be supported by the rear rods on the edge of the display screen or use a backing element generally as large as the display screen to transfer the pressure.

Version 4
However, in the fourth variant , curvature of the frame element is less of a problem as the rear rods are located in holes/recesses in the inside edge of the frame element. Indeed the possible core (or laminate) structure of the frame, to present edge "holes", is likely to give extra stiffness to the frame element.
Releasable security for the placement of the hoops on the corners of the display screen is thus provided by a mechanism which can be simply described as rear pressure holding the display screen in a position relative to the hoops such that they may be attached or released by countering that pressure. .While a clip frame uses recesses in the backing board to lock the clips in place the current invention blocks removal of the corner hoops with the frame element.

More specifically, forwards pressure generated by rear rods or stressed backing panel causes the display frame to be located as far forwards as possible within the hoops so that the angled inside edge of the display frame becomes the fulcrum for rotation of the hoop is so that the rotation radius is too short for the corner of the display frame to escape the hoop. Continued application of force, pushes the hoop till the rear rim meets the rear rod at a point still further away from the corner and so rotation about this point also fails to remove the hoop, (unless the hoop is raised , as is generally not the case.)
In order to rotate the hoop *onto* the corner of the display frame, during assembly, it is necessary to position it adjacent to the angled edge of the frame element and press from behind so that the display screen no longer maintains its forward relative position in which it blocked rotation of the hoop. The point of contact of the bottom rim of the hoop, with the rear rod will become a fulcrum, and giving the full diameter

of the hoop opening as a rotational radius, which will cleanly pass the display screen! The mechanism could be described as a "restricted rotation mechanism".

The hoops have been found to be secure in practice , as well as easy to attach if lifted into position as described.

To achieve the above variant it is possible to use a hollow core plastic material known as **"Corex".** When cut this material will expose its hollow flute structure to provide holes in the edges of the frame element into which the (resilient) rods can be securely placed by flexing.

The prime aim of this patent application is to protect the preferred version 4 (and other versions as can be included in the claims, as prior versions and corollaries.)

The backing sheet can be made of the same material, from the frame aperture. If rotated to an angle corresponding to that of the diagonal of the rectangle defined by the display (square or photo for instance) then one diagonal rear rod can be placed within it , while the other rod provides extra pressure by passing over the backing panel. To stop the panel sliding up along the flute when subject to self-weight in hanging mode, one or more elements such as standard metal paper clips can be inserted via slots in the flute to exert pressure on the rod within. A central paper clip can be distorted to extend vertically to make a hanging hoop, as well as hooking over the second rear rod . Edges of the backing panel can be folded up to provide spacers for parallel hanging , and these can be angled inwards by means of an elasticated element hooped around the exposed edges of the flaps, being partially resisted by the resilience of the material in achieving the folded position. (Dye-cutting technology may obviate the need for an elastic element, and the inward angle is not necessary except to minimise visual impact from the front.)
A vertical fold and cut in the lower flap will enable a section to be folded up to form a secondary flap so that a strut dimensioned to forcibly fit into a flute will extend downwards and outwards to enable the frame to be set on a horizontal surface. The top of the folded section can meet the bottom of the central paper clip (or one inserted and twisted, as necessary,) and the end of the strut can be chamfered to meet the surface, to maximise stability.

Using Corex presents the possibility of applying both front and rear rods directly into available flute ends, (parallel or diagonally), so removing the need for hoops. In fact, in practice the flute size was found to be subject to variability which can significantly reduce the bearing in the case of rods being diagonal. Using hoops helps to mitigate in this respect, as for instance a mis-aligned rod (owing to an unfortunate position of a flute wall) can still be accommodated within the hoop, thus giving extra security for a compromised rod end.
It may be necessary therefore, in manufacture, to co-ordinate the window with the flute spacing so as to avoid this problem as far as possible. The display screen can itself be located into the flute structure and mediated by hoops , optionally supported by rear/front rods, but this relies on elasticity within the Corex to insert opposite corners and as such, is not preferred. Equally flexibility of the display screen will enable it to be inserted directly into grooves in the frame element , created by cutting along the flutes in the Corex structure. As an alternative to Corex the frame element

may be fabricated as a laminate, for instance, or any other way that will provide necessary recesses for the assembly to be completed.

Other versions are proposed where, again, the rods pass directly into holes in the front and rear of a resilient frame element. Such holes will generally be near the corners of the display screen but may be part of a lattice structure, or repetetive pattern. Holes may also be made in flaps in the frame element to accommodate rods or the corners of the display screen itself ,or both, (and said flaps may be resistant due to the resilience of the material.)

Version 4b as described in "summary" above.

- **ELEMENTS and MATERIALS**

Rods: (also see note in the description of the invention as structure,)
These are primary pressure providing elements and generally made of a resilient material such as wood or plastic, but with obvious adaptations where necessary elastic materials can be used as the effects of the resilience of the rods can be recreated elastically and blocking functions may also be adequately met. Rear rods are generally "primary" and may thus be larger than the front rods which act as bolts. In version 4 they must be strong enough for their resistance to bending to provide enough forwards pressure to hold the display screen in a position where the corners will block rotational release of the corner hoops. In version 4 the combined depth of the rear rod and the display screen (plus any intervening backing sheet at the corner) must fit inside the hoop at the critical angle to allow it to rotate and such that surplus space as exists can be taken up by the mechanism keeping it in a position at the back of the display screen where it will not enable the hoop to be slipped off.
(The cross section is not critical. A round section at the rear and a smaller square section is preferred for the simple version, within the frame element.) Such rods need not pass through the hoops but may pass into the frame element directly or even to the opposite side of the frame element through the gap between the display screen and the frame element.
Instead of being parallel or diagonal the rear rods could each describe a semicircular shape or any shape which permits their usual function.
Instead of generating pressure by flexing over each other , or a backing panel ,or other element , or causing a holed backing sheet in resilient material to flex, the rear "rods" may be pre-formed as bent resilient elements, also then able to apply pressure to the rear as they are straightened into position.
Rods may also be adapted with an impediment to the unintended movement of the hoop elements. A pin for instance, may be inserted into the rod behind the hoop element to stop so that its head stops the hoop rotating off the corner of the display screen, even when pressure as would otherwise release it is applied, and this pin may have known (or other) means of itself being secured.

Display screen: Generally transparent (unless a mirror, or other display such as a clock, or lamp diffuser), generally stiff or rigid (may be flexible but then tending to reduce security), generally rectangular but other regular or irregular shapes are possible, with a suitably adapted frame element giving necessary support to hoops (if used). Clearly versions 1 and 4a require hoops to be located onto the display

screen itself , yet other versions can use a circular display screen held by rods located in hoops which do not locate on the display screen directly.
(In theory a pre-formed, curved, display screen could be used to trap the display item when flexed to a flatter form and so secure itself within the frame directly or within hoops rotated onto corners.)
Extra security could be provided, for instance, by small clips attached to the corners of the display screen, outside the hoops to resist removal of the hoops and the display y screen can also be adapted with a built in impediment at the corner.

Hoops: Standard washer form is suitable with rigid material providing greatest security but risk of damage to display screen so less harsh, stiff materials would be suitable also. Excess elasticity can result in insecurity/instability. Resilience in the case of the integral hoop/strap element in the first variant is necessary. Front rods acting as bolts will cause the hoops to sit in a generally more upright position; otherwise they "lock" at angle inclined away from the centre of the ensemble (as their rotation about a horizontal diagonal axis fails to clear the corner of the display screen.

Note that in Version 4a that inner rims of the hoops lock, at two points, with the diverging sides of the display screen, so this contact occurs non-axially. This is represented in the axial drawing fig 8a on p12. The hoop in position 3a , restricted by rod in position 5a is, in fact, locked onto the display screen. Positions 3b, 5b represent the release positions.

Backing panel(s) / sheets : may include a secondary decorative sheet (or strips) visible in the transparent margin. May have a role in directly applying pressure, by flexure, for display item location (or display frame gripping mechanism, as described), in which case a resilient material should be used. A pre-formed bent sheet of material able to apply pressure when straightened into place in the hoops or frame element can also be used to apply pressure for both location of the display item and to support any mechanism used to releasably hold the display screen. The hanging system can then be integral to said backing sheet or otherwise affixed to it. The backing sheet may also be clear/translucent of a material the same or similar to the display screen. It may be the same material as the frame element such as Corex, and thus made from the cut out material, possibly realigned. Flaps in the backing panel (or other attachments, such as suckers,) can ensure parallel hanging on walls and an adapted flap enables a strut to be deployed at the necessary angle. It is a feature of the design that the backing panel (if any) need not be prepared with any means (such as holes, grooves etc.) which are necessary for securing clips, as is the case with known clip frames. (The invention meets function by diametrically opposing forces proved either by a stressed tensile tie or by the resistance of the frame element also operating diametrically, as well as supporting the mechanism involved in securing hoops onto the display frame in version 4.)

Note: the invention can generally function without any backing sheet as rear rods or ties, themselves provide pressure for location of the display item and other elements can provide means for hanging, (also provided by the cleft between diagonal rods) and parallel wall hanging.

Frame element: can be simply a sheet with slots (for location of hoops,) or holes (for front and/or rear rods), and preferably a means of access to adjust the position of the display item behind the display screen. In preferred versions the frame element has a window cut out from a resilient material.
In principle the frame element is rigid and is involved in supplying a diametrically opposing force (directly or as a resultant) to resist a displacement force on the corner hoops.It may however adopt a curved form. (see below).

Optional holes are provided in the corners or in the internal edges of the frame aperture. As such these may be provided using a hollow core fluted structure such as "Corex" which presents holes when cut across the "grain". These holes allow the display screen to be supported outside of the plane of the frame element, and also to be gripped by a mechanism. As anchor points for supporting rods they also help in the assembly process. However a simple version uses a frame element which requires only the principal window aperture in the frame element.

The frame element can be made of virtually any material and is essentially planar, but may be curved (pre-formed) or bent, and held in a flexed position by elements within the assemblage such as struts (mounted for instance as the rear support strut or rods or straps acting as ties if not precluded by Hillary Ellison 's US Patent relating to a self-supporting curved face structure achieved by means of a tie strap.
A curved form may be achieved by aligning the Corex flutes horizontally and placing a pre-curved rod element within flute(s). A length of stiff wire possibly hidden in a decorative tube (such as a drinking straw) would function as required. Slots cut in the Corex flutes would enable it to adopt a curved form with flutes running vertically but this is not preferred, (as a greater degree of natural flexibility runs with the grain).
Both the inner and outer edges of the frame element, providing hoops are supported, so that it can have curved edges; it can be a circle, ellipse and many other shapes, including for instance irregular curves across the grain, and straight sides with the grain, or "S" shapes for example, on all sides.

Hanging element : Holes or a "treasury tag" (with toggles inserted into the Corex flutes) can be used to provide a hanging facility, but the preferred system is to use a standard metal paper clip inserted into a central flute where as in version 4 , it also provides pressure to help secure the backing sheet, and can also trap the second rear rod as it twists up to the central hanging point. It can be removed to relieve pressure during replacement of the display item.
It will also restrain the top of a folded flap housing the strut used when self-supporting and can be twisted to improve this function , (or of course another hoop instead.) It can also help secure the strut when in a stored position. Extra clips can be used for extra pressure as required.

Strut(s): a straight strut, preferably with a chamfered end to make contact with the tabletop, can be forcibly housed in the Corex structure in flutes in a secondary flap in the backing panel, angled outwards and downwards, as shown. The changing exposed can be simply adjusted to change the inclined angle of the frame.
Similar struts can be used to push the central section of the frame element back so that the frame becomes self supporting.

(This can also be achieved by other means such as pre-curved stiff elements being inserted into flutes arranged horizontally, and other means such as large rods wedged between display screen and frame element.)

Multi-frame:
Alternatively the frame-like zone corresponding to the transparent margin can be released to make a new frame, smaller than its "parent" and with angled corners, being suitable for use as an economy version or inclusion in a multi-frame, by means of rods run through the Corex to join units together in linear or chequer board patterns. It is also possible to join units together by means of a continuous backing sheet. Rods of circular section may be inserted into the flutes prepared with slots more easily and held in place by the resilience of the plastic flaps so formed. The panels thus created can be interlocked (also by creating a standard hinge structure) to form folding screens, box style lamps, waste paper bins etc or given their own feet to function as display screens with or without the windows and display screens, as described. The same construction can be used to combine the primary Corex versions and indeed to provide feet and finials as decorative features, (incidentally causing the vertical edges of the frame element to flex forwards.)

A more elaborate version uses hollow section rods which are provided with a slit so that they can embrace the ,also slit, penultimate flutes of the frame element, and be held in place by the resilient flap of the frame flute pressing the "rod" into the said flute .

NOTE:
Similar hollow section rods can be fitted onto the edges of the display screen, with angled ends so that they are constrained in place by the hoops. These also can have a decorative function.

ASSEMBLY: an embodiment of the invention as described in version 4b
See P12, P13 FIG ,8a, 8b, 8c
Note: The backing panel diagonal centre should be a flute wall (not as shown).

The first rod (5) is placed in the Corex flute *above* the centre line of the backing panel (13) with hoops (3) attached and the (lower) end is inserted into the Corex at the corner of the frame element (1). The second rod (5) with hoops (3) attached is placed over the backing panel (13) and similarly into the framing element. (1) From the other side the display screen (2) is placed so that the corners overlap the angled corners of the frame element (1). The hoops (3) are then rotated into position, until all four corners are enclosed. It is preferable to position the display item at this stage prior to insertion of the paper clip (16), or even with one or two hoops undone to relieve pressure. Extra clips similarly inserted into the Corex or staples to engage the rear rod(s) can be used to prevent movement of the backing panel in larger embodiments.
Further steps to organise the rear for hanging/table top use are then carried out, as described above. Front rods (4) can also be deployed for extra security, if required.

ABSTRACT

A demountable structural assembly which comprises a rectangular planar element(s) and support element(s) such that "hooped" means of attachment enable support element(s) to be stressed between fixed points. The resulting pressure secures the assembly and locates display items behind the (transparent) planar element. When integral, the hooped elements can be given extra security by attaching suckers to them and to the rear of the planar element.

When they are separate a frame element, as well as the support structure, acting as bolts, and/or other mechanisms are used to secure the "hoops." The hoops contain support elements to act as bolts to trap the planar element and the frame element together. Movement of the bolts can be restricted by being "attached" to the frame element, and/or the hoops being "attached" to the corners of the planar element, so front bolts are optional as in

Version 4a (p12, 13, 14 fig 8a, 8b, 8c, 8d.)

This involves a latch mechanism which uses the rear pressure from primary structure to enable the corners of the planar element to block simple rotational release of the corner hoops. The rear pressure is manually countered to enable assembly and disassembly.

A transparent planar element and use of rear pressure for location of a display item and rear support structure for hanging and with a strut, for table top use, make it suitable as a "display frame".

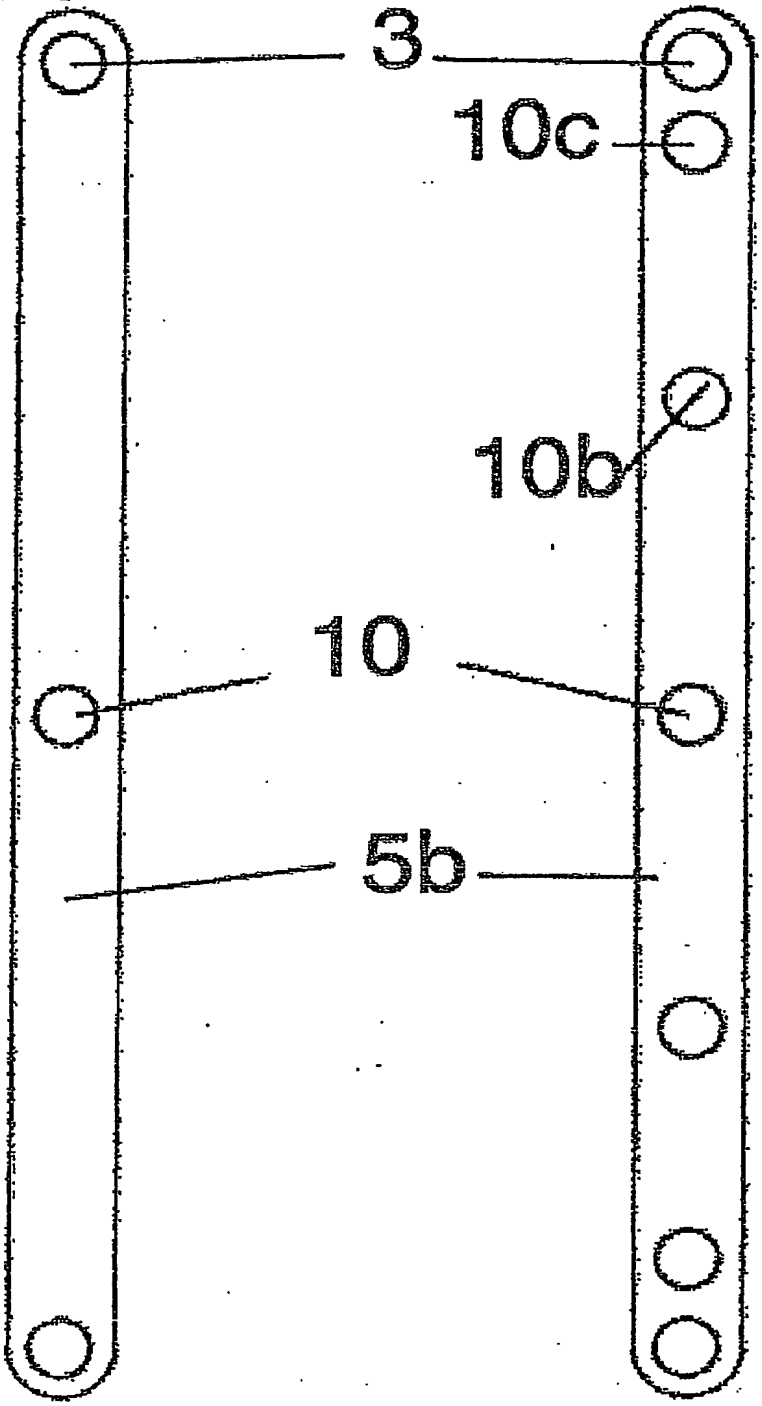
Multiples and other uses are envisaged.

KEY TO DRAWINGS

1 Framing element.
2 Display screen.
3 Hoops.
4 Linear element as front rods.
5 Linear element as flexing rear diagonal rods.
5a Tensile linear element.
5b Torsional linear element
6 Linear element as rear horizontal rods.
7 Backing sheet.
13 Backing sheet.
13b Parallel hanging folds in backing sheet.
13c Secondary fold to house strut
8 Tongue for attaching tubular support strut.
9 Support strut.
10 Hanging hole (can also accommodate support strut.)
10b Hole for mounting sucker or multiple rod attachment.
10c Hole for corner sucker
11 Decorative sheath
11a Outer fold.
11b Inner fold.
11c Folded edges.
12 Toggle.
13 Backing sheet.
14 Table top.
15 Void.
16 Sucker
17 Display item where shown.

CONTENTS OF DRAWINGS

FIG 1



normal

FIG 1B

with extra holes for suckers

FIG 2a, 2b

side and rear view version 1

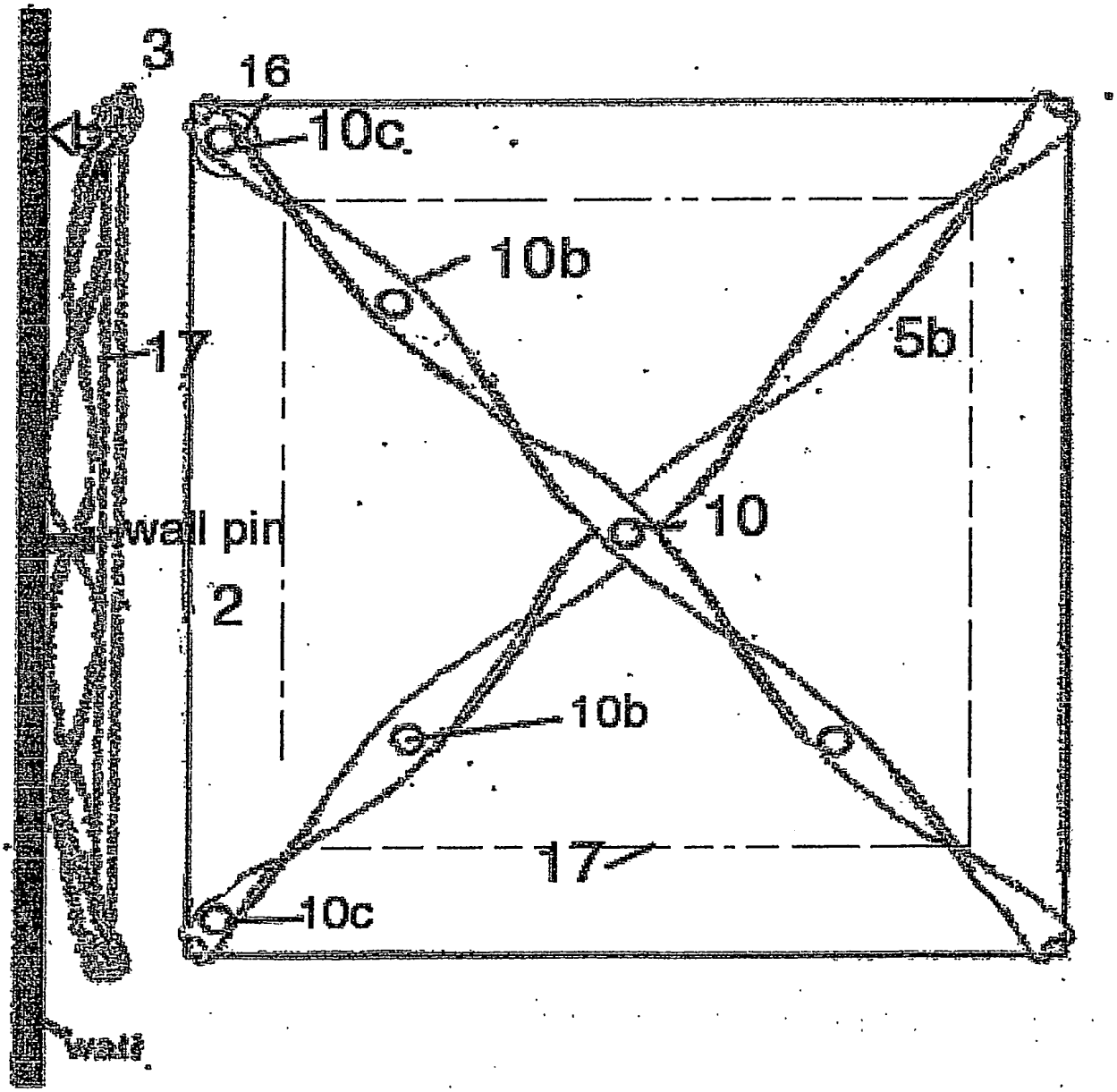
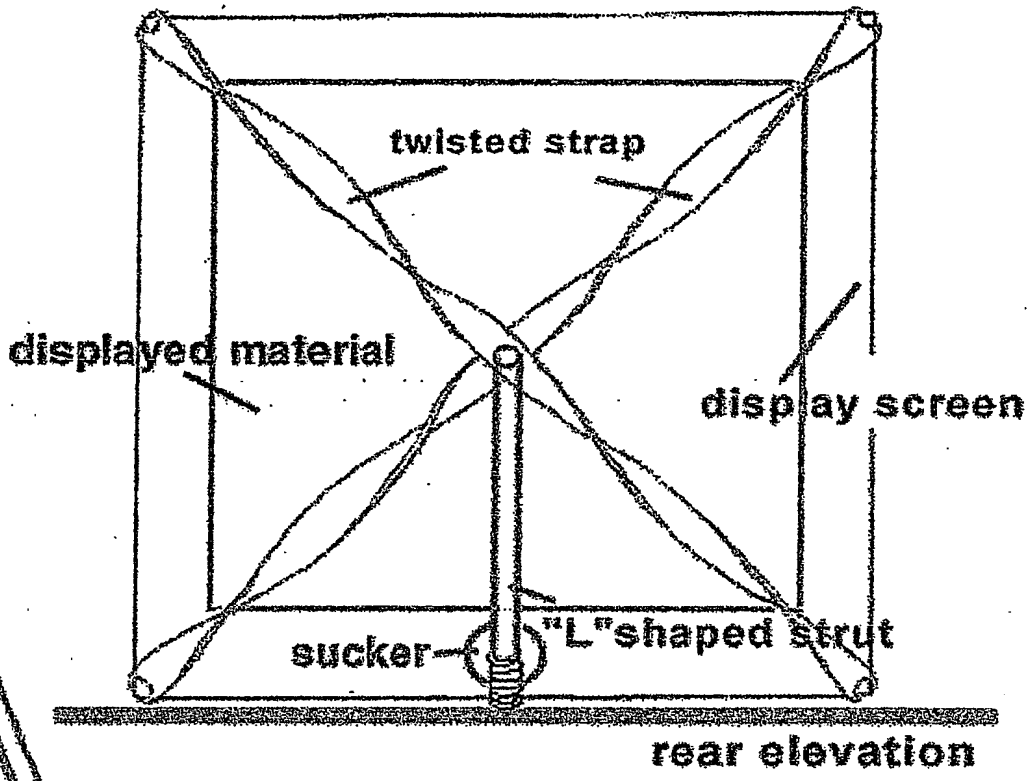


FIG 3a drinking straw strut withsucker



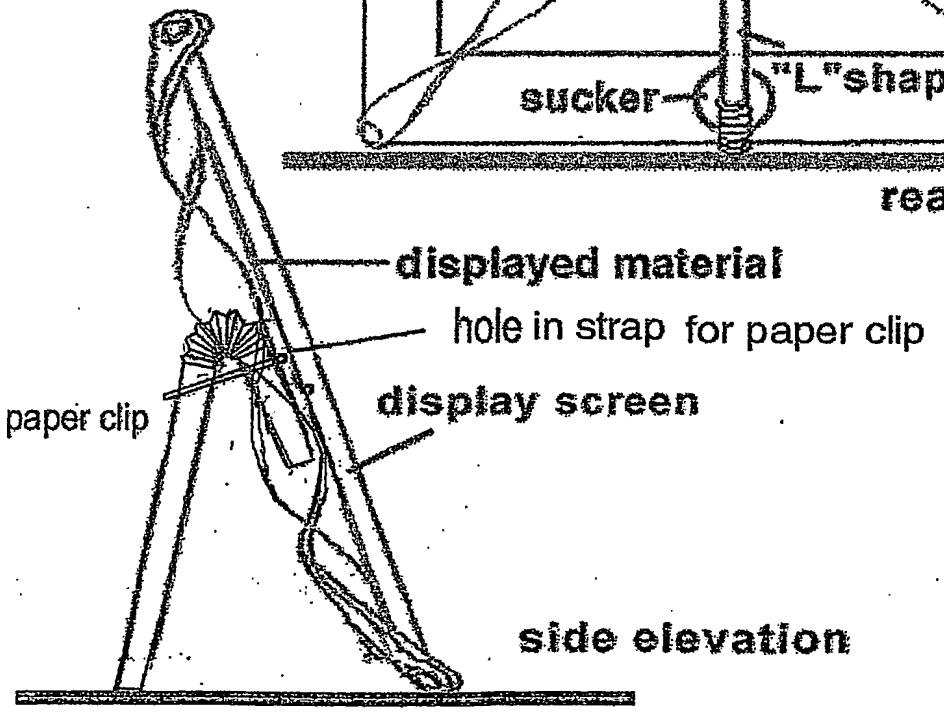


FIG 3b drinking straw strut with paper clip

FIG 4 Version 2

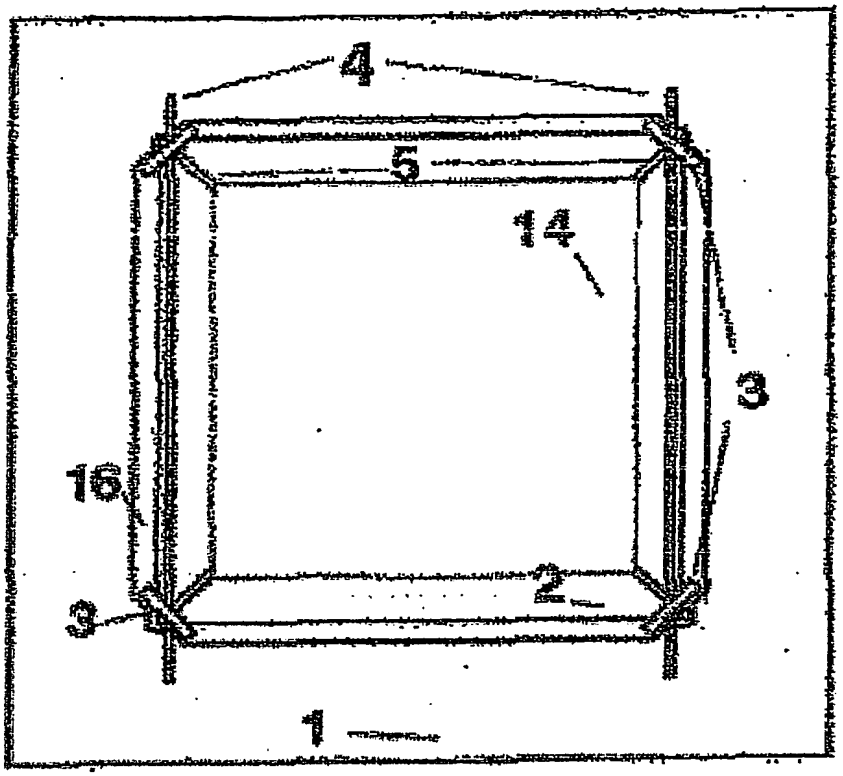


FIG 4 Version 2

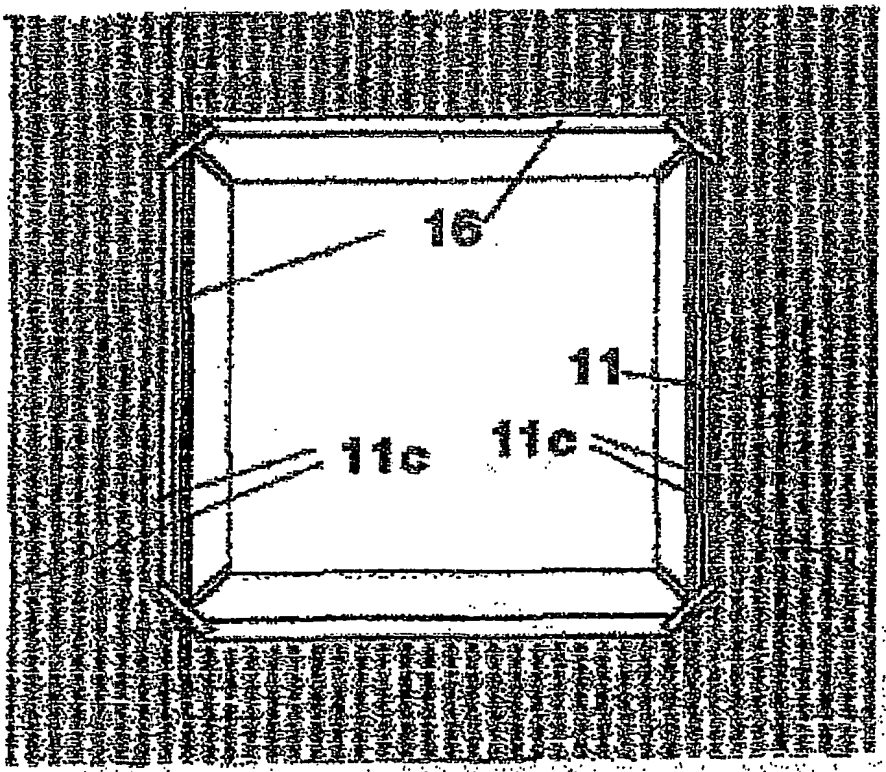


FIG 4c Version 2

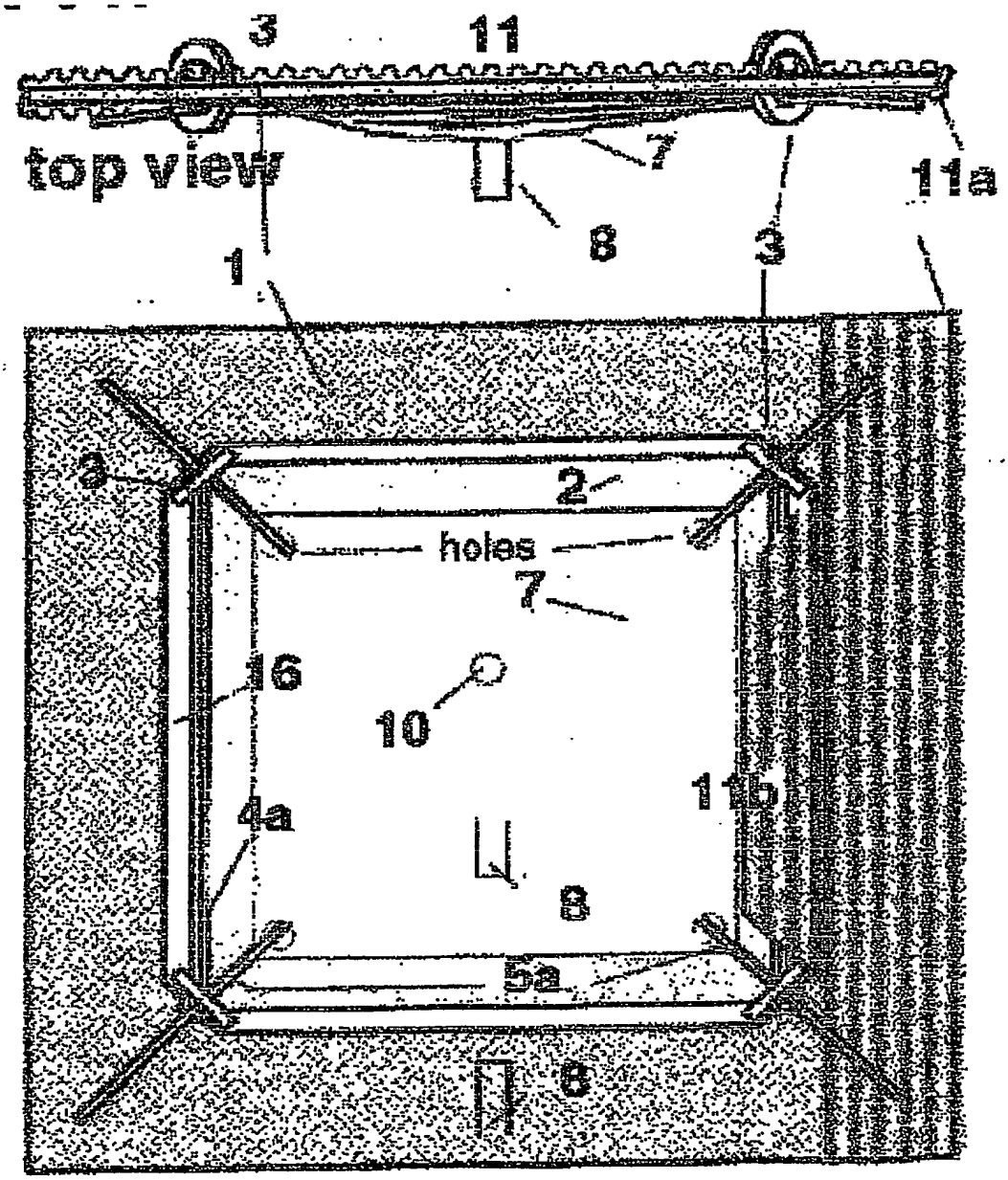


FIG 4d Version 2
rear view

FIG 4e
side view version 2 table top

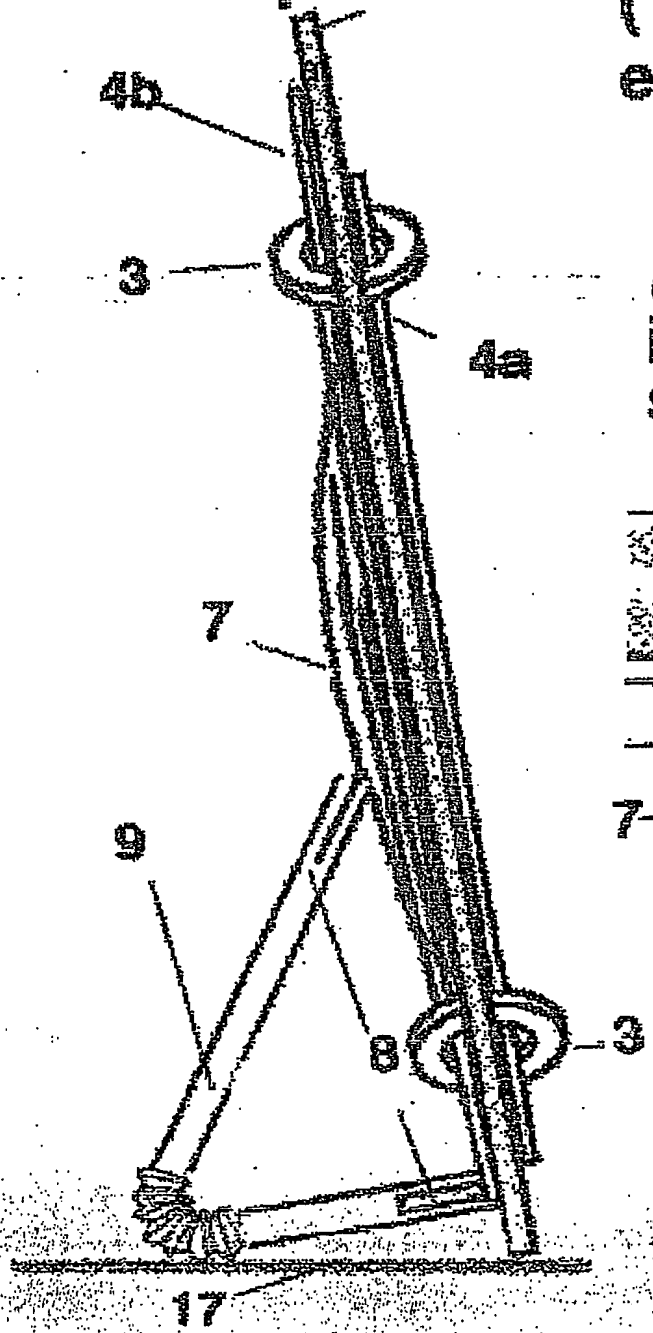


FIG 4f
corner adapted version 2 (tensile linear element)

only this hole if no sheath element

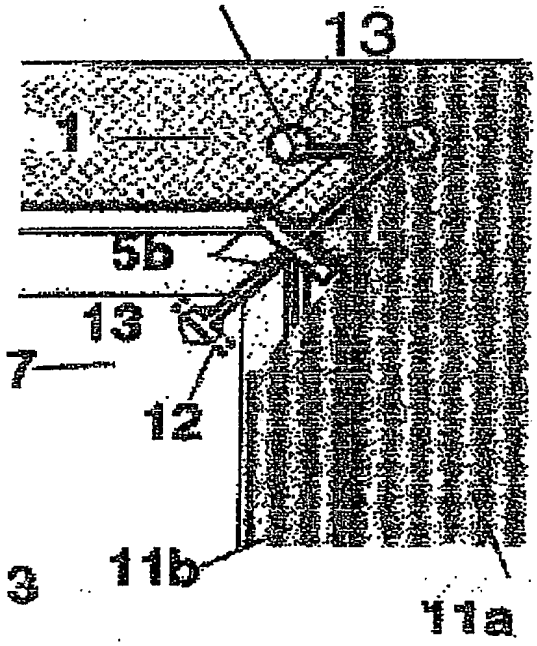


FIG 5a
version 3a
front view

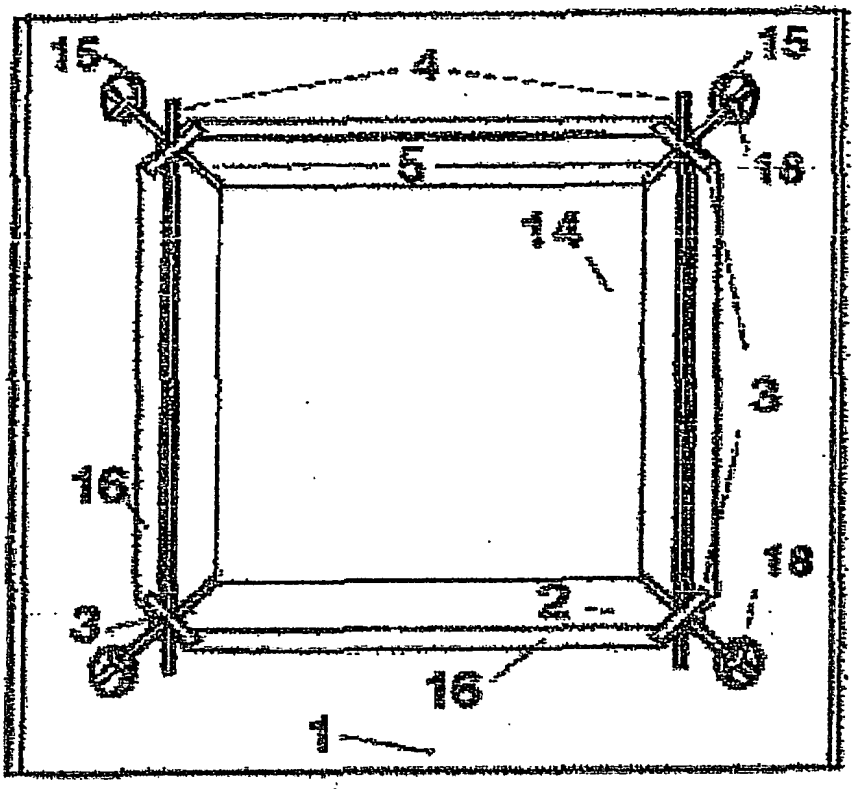


FIG 5b
version 3a
rear view

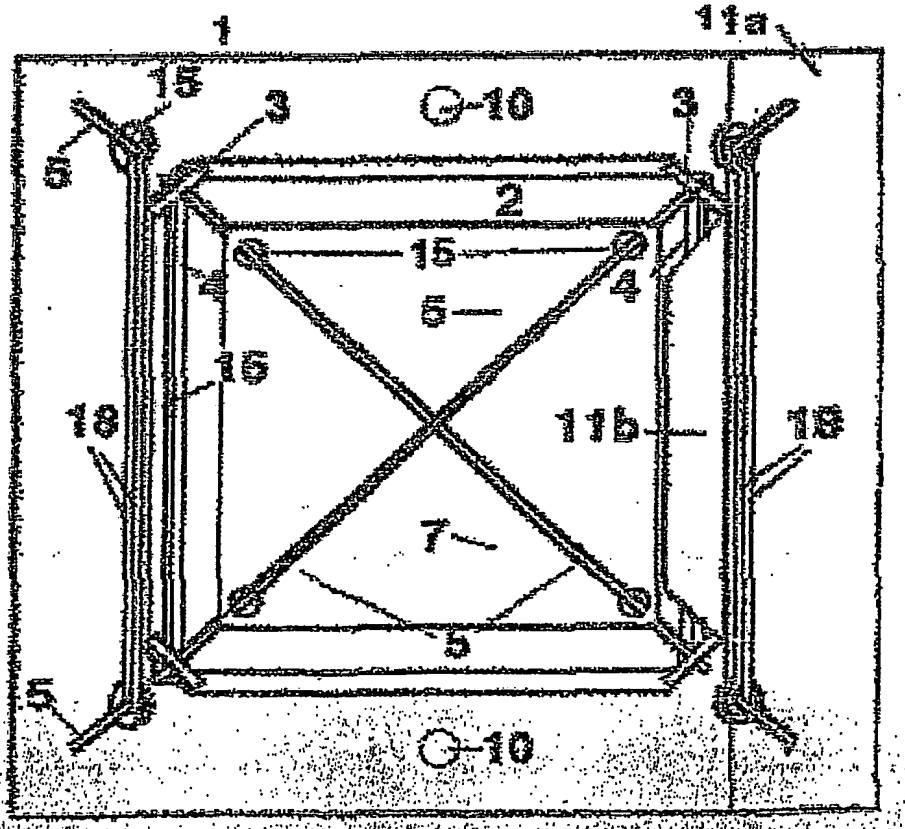


FIG 5c
version 3a
wall-hanging
central section

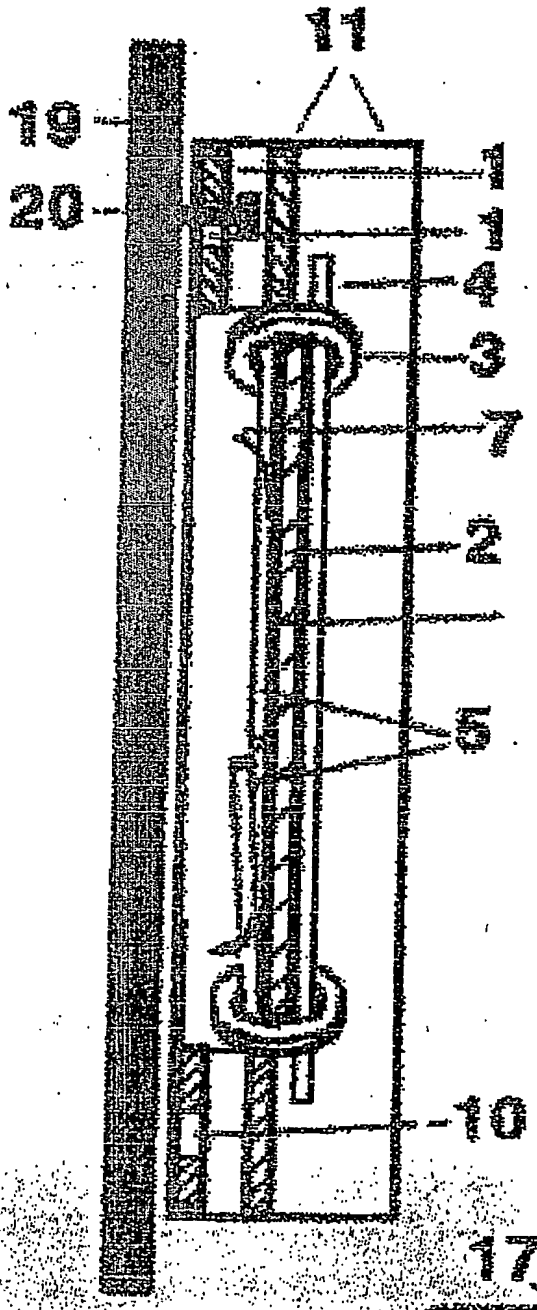


Fig 5d
version 3a
table-top
central section

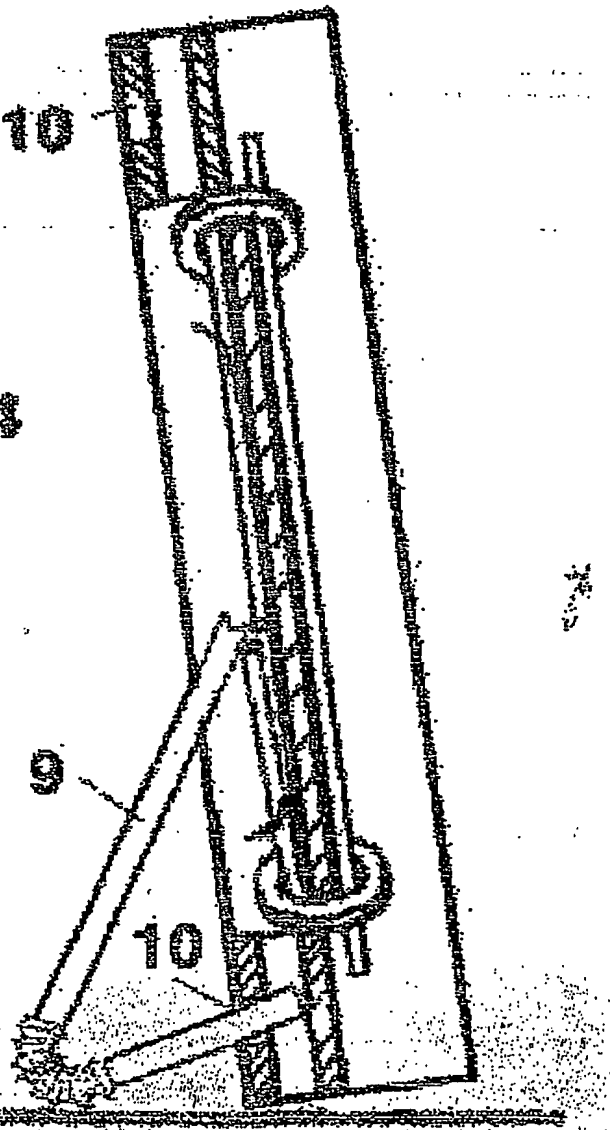


FIG6a version 3b front view

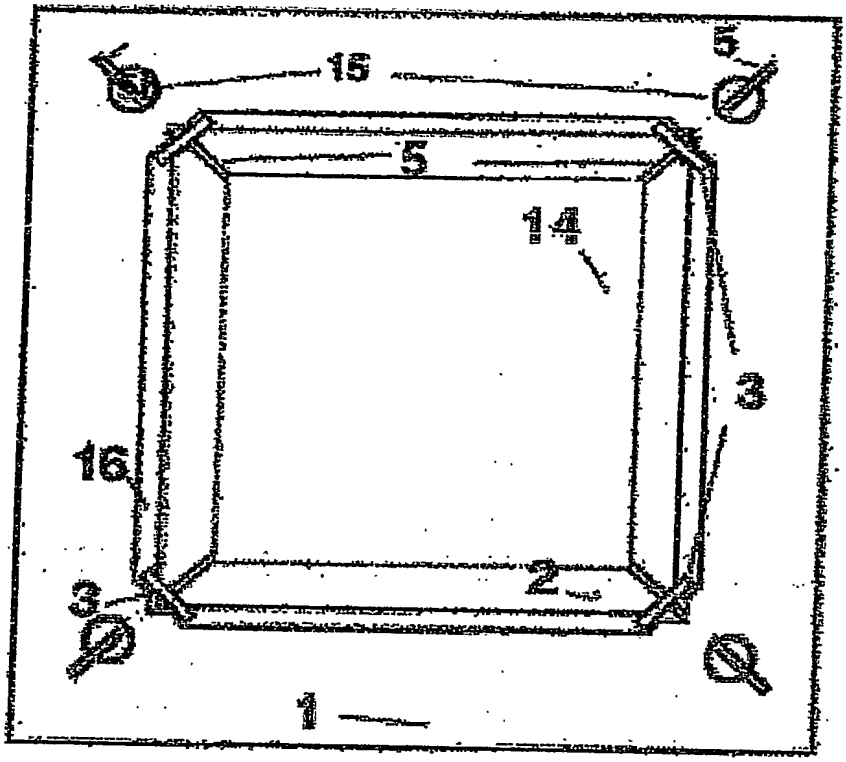


Fig version 3b rear view

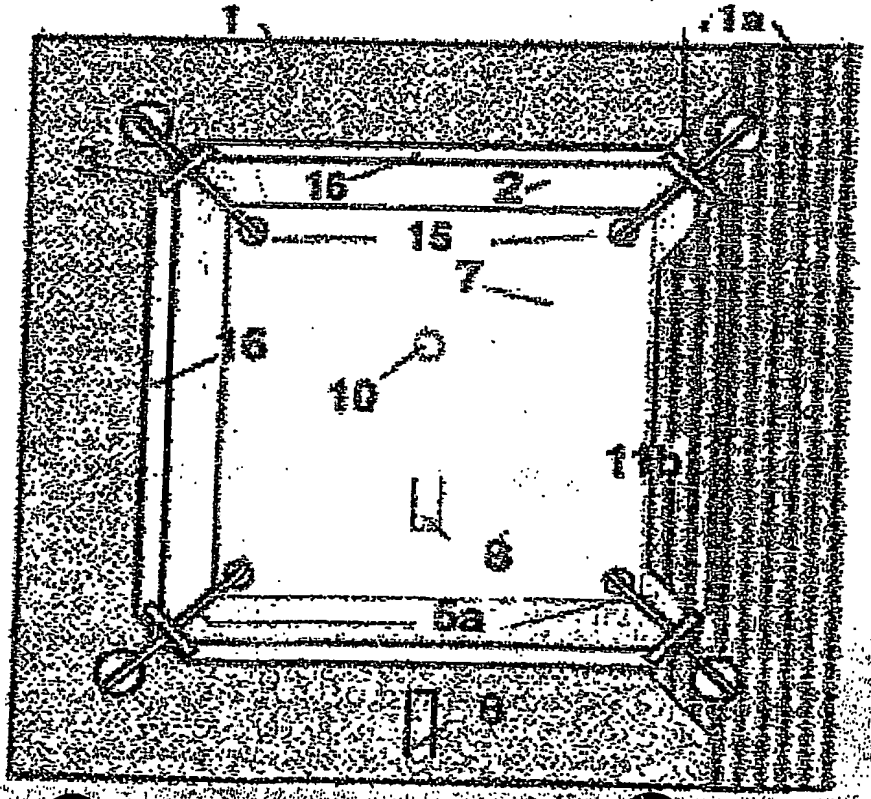


Fig 6c
version 3b
plan section

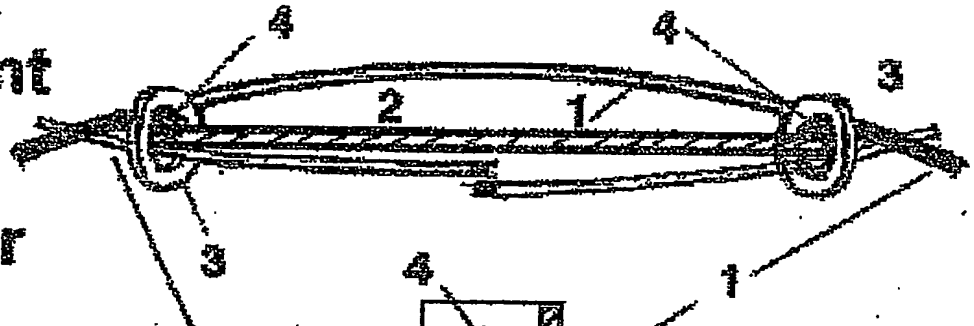


Fig 6d
side section
version 3b
table-top

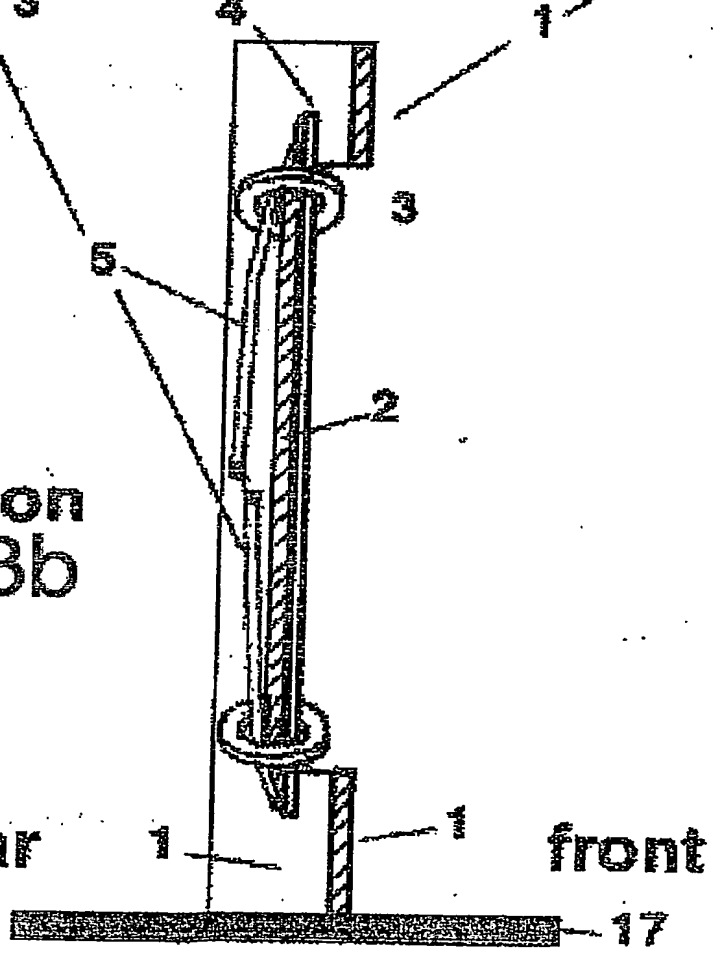


FIG 7a
version 3c
front view

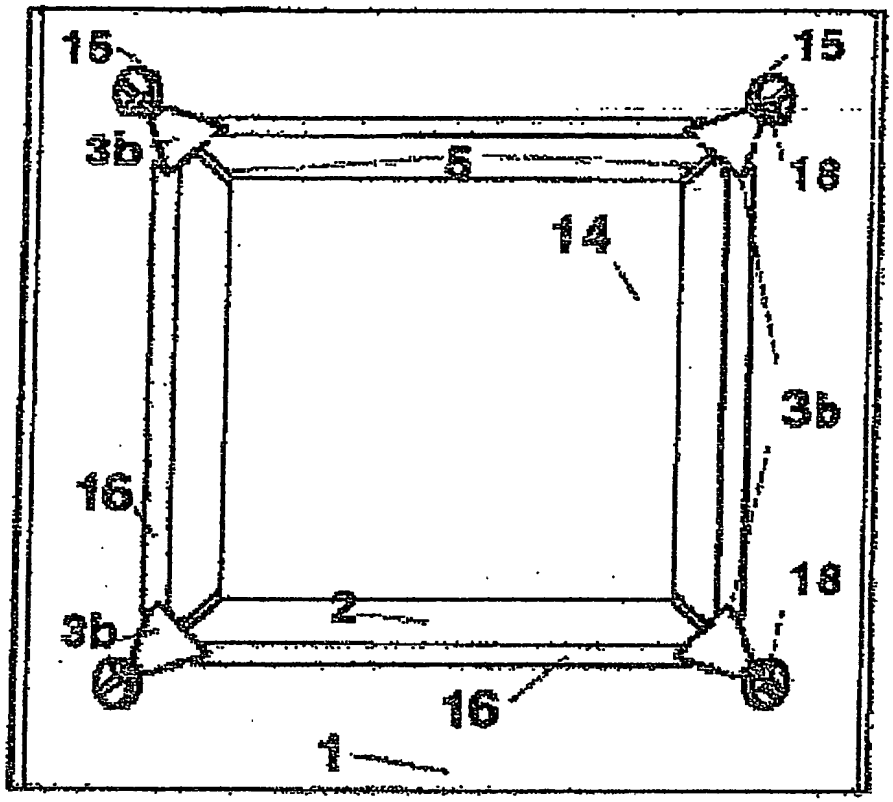


FIG 7b
version 3c
custom hoop

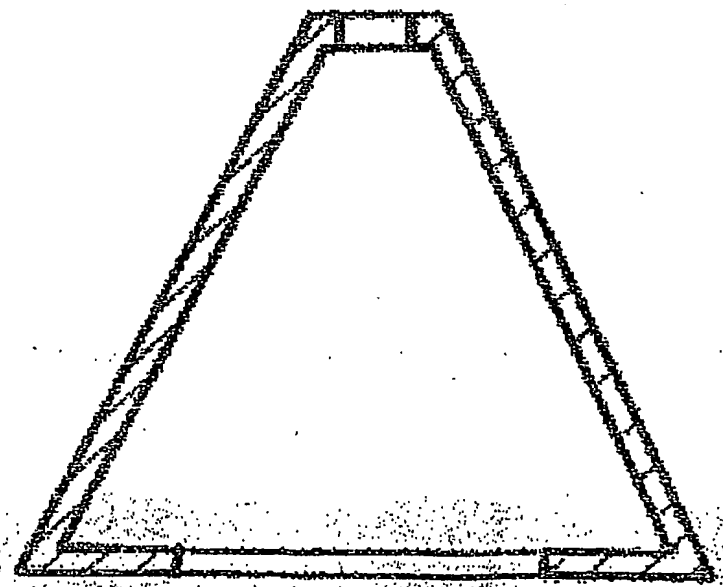


FIG 8a

Version 4a
mechanism for assembly/locking

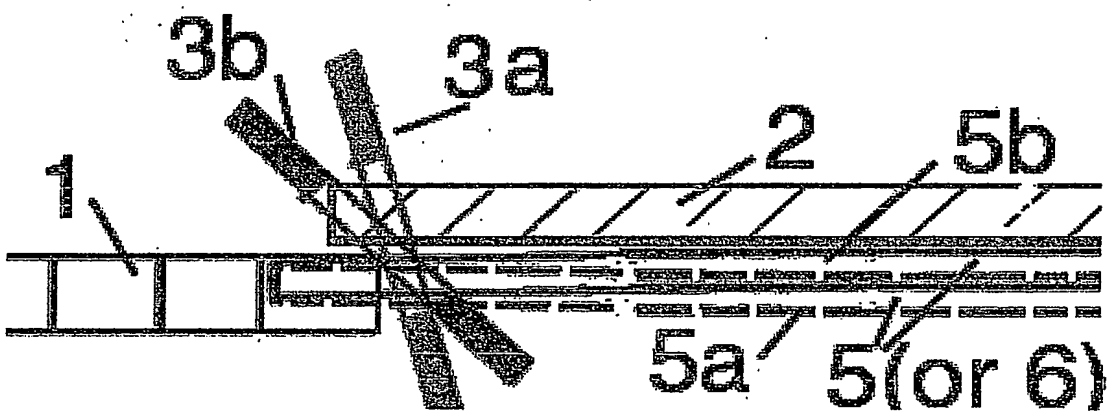


FIG 8b plan-section version 4a

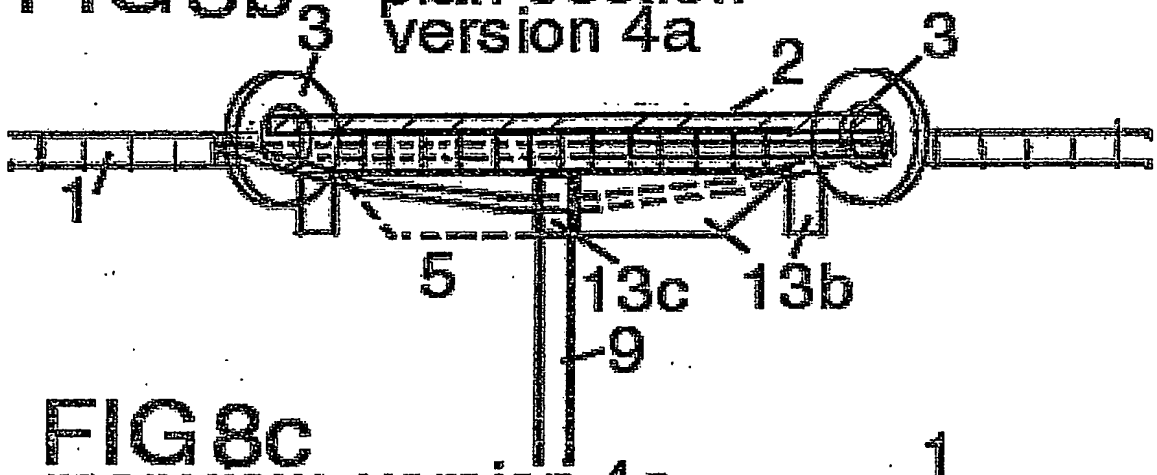


FIG 8c rear view version 4a

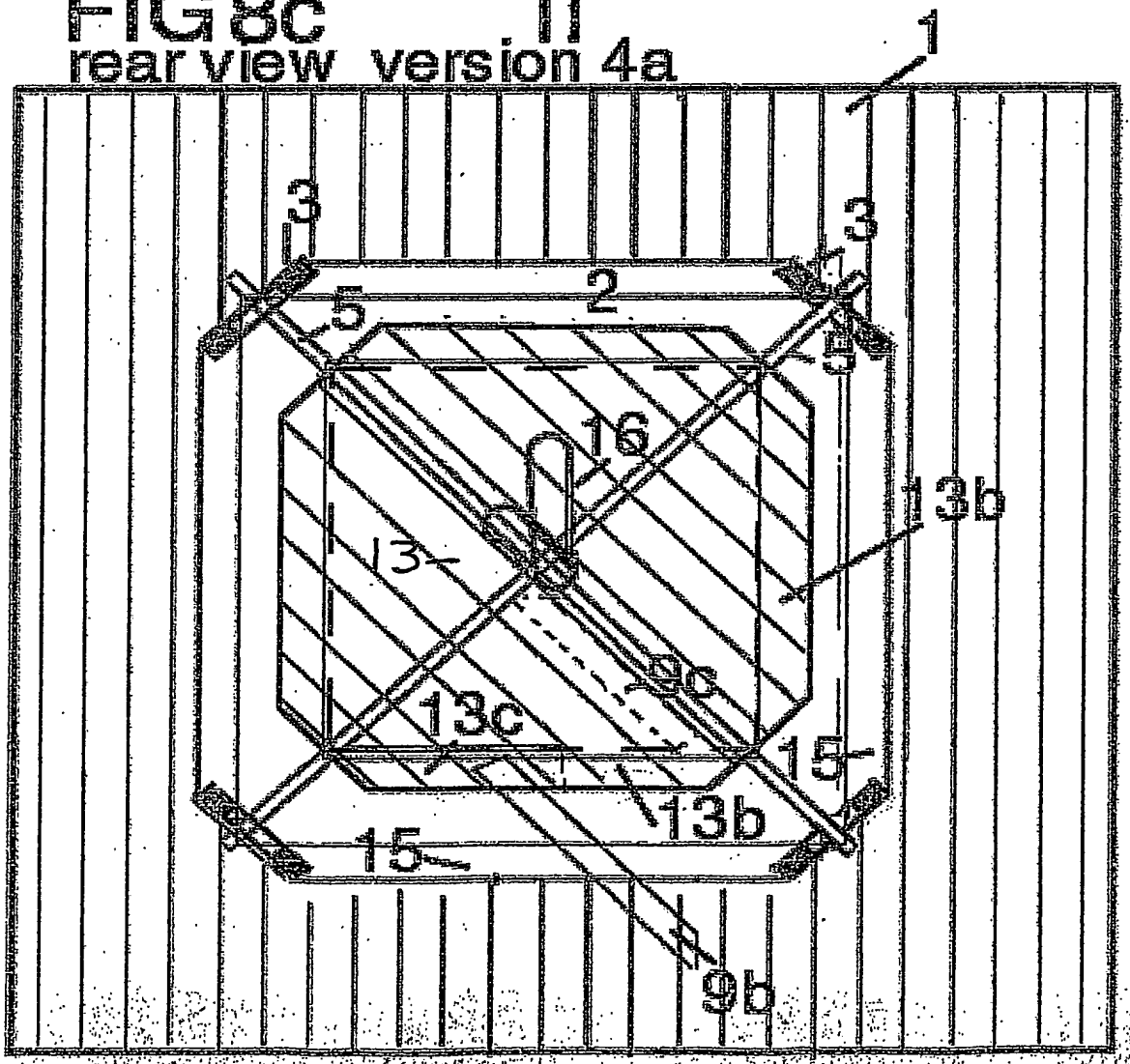


FIG 8d
version 4a
side view table top mode

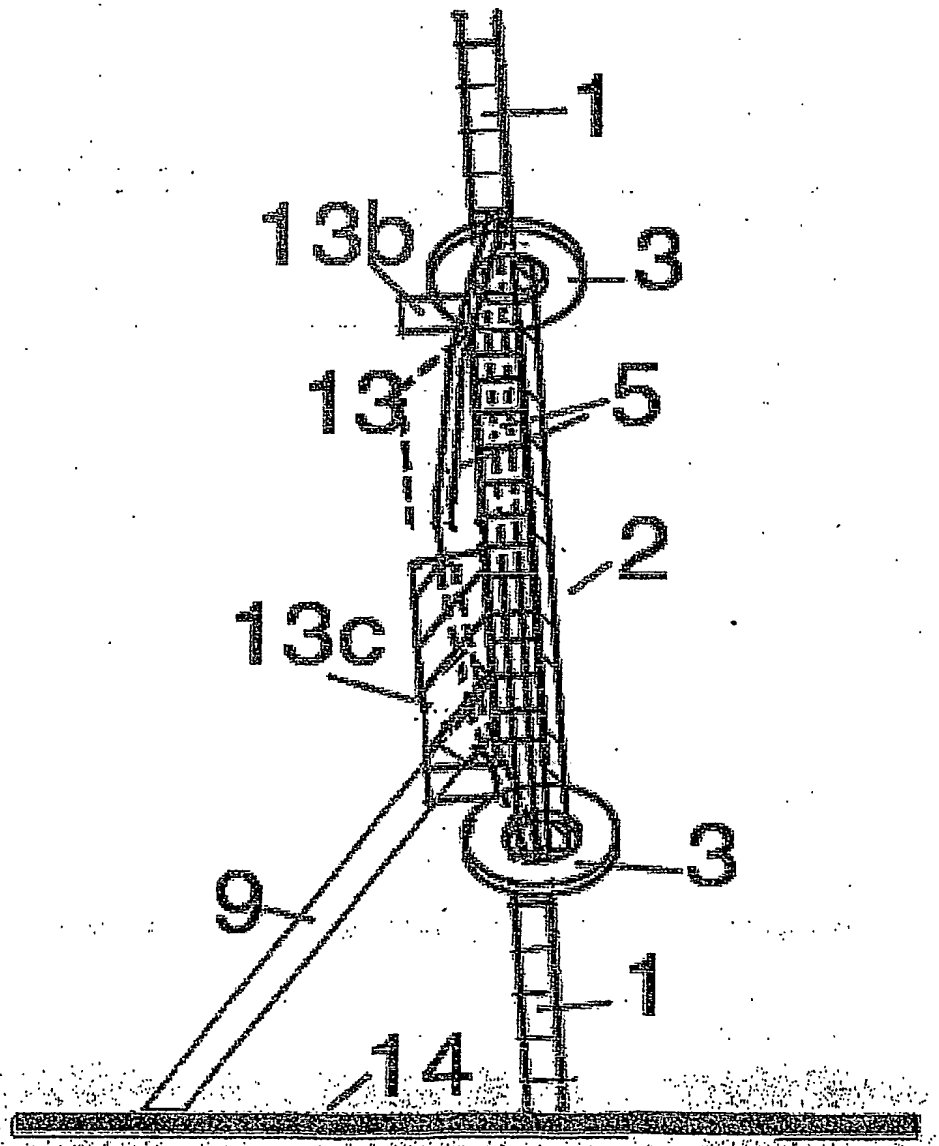


Fig 9a diagonal rear struts

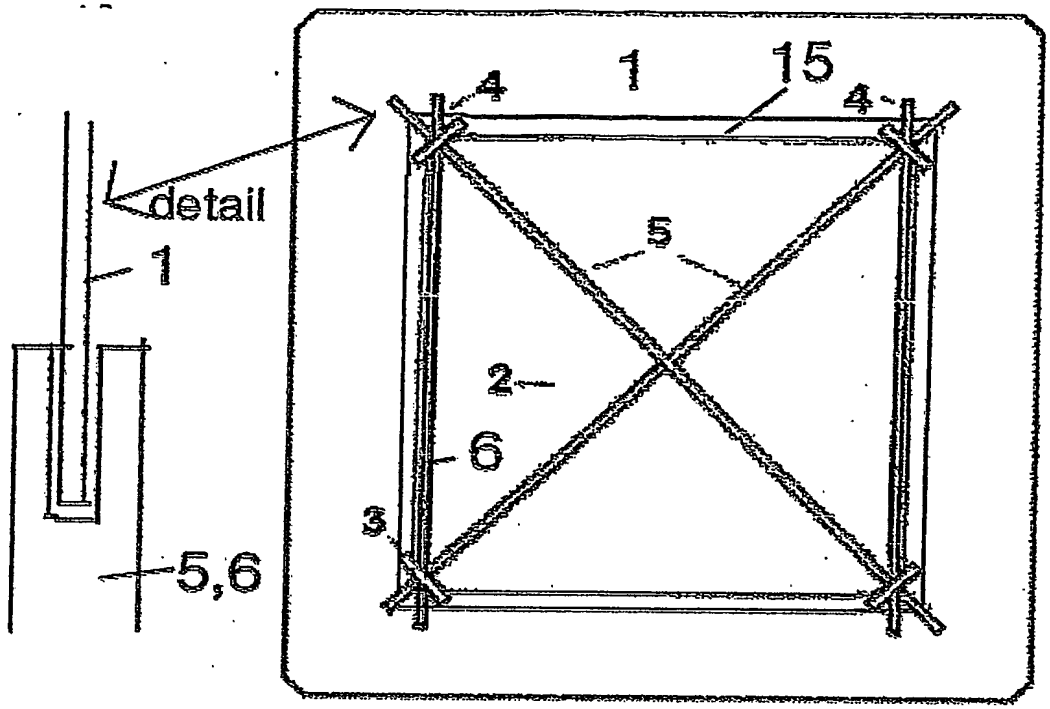


Fig 9b parallel rear struts

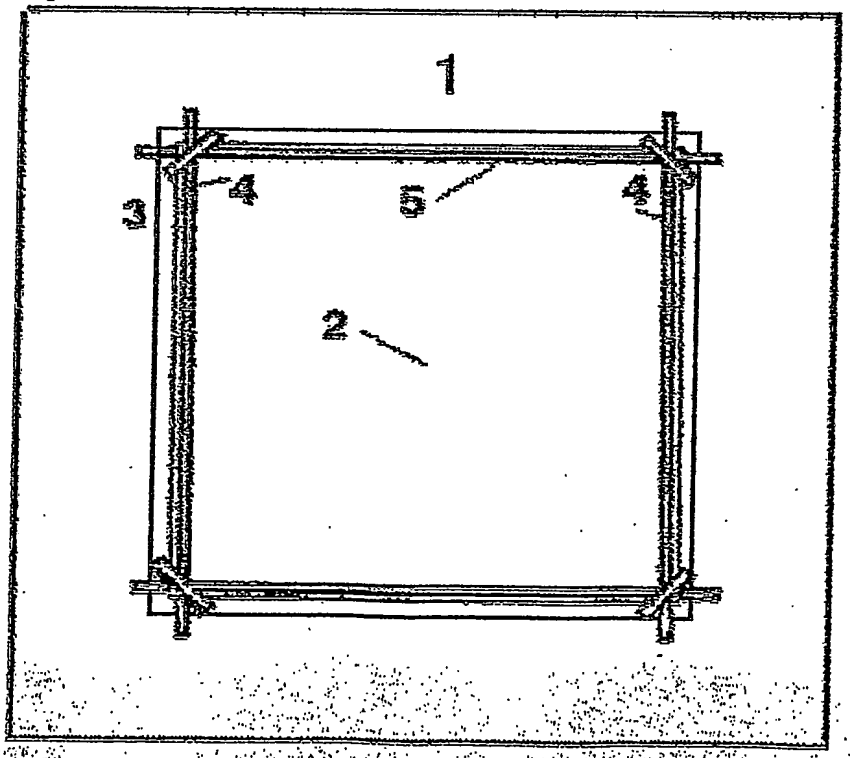


FIG 10 Version 5 foldable hoops front view